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US 5394562 A

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Online: WPI, JAPIO, EPODOC

(54) Abstract Title
**Storage of traffic broadcasts in an RDS receiver**

(57) A mobile communications device having an RDS receiver stores broadcast traffic announcements so that a user may access previous announcements before starting a journey. The speech may compressed before being stored in a memory. The user may be able to specify the period during which the broadcast signal is monitored and / or the signal recorded.

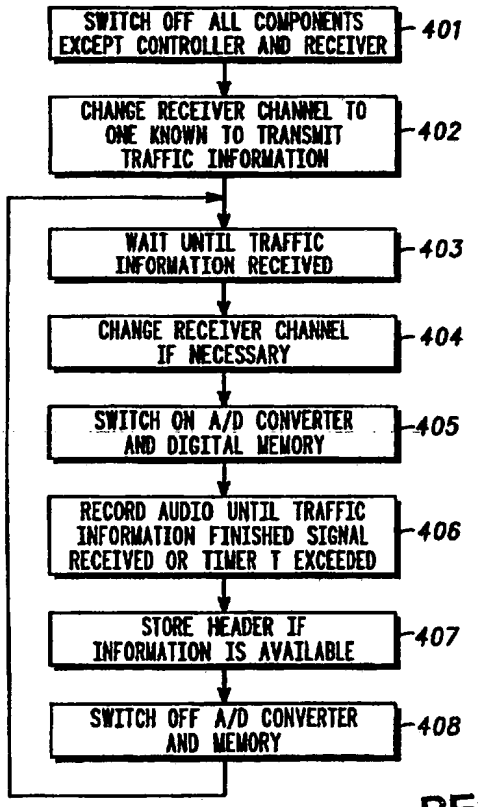


FIG. 4



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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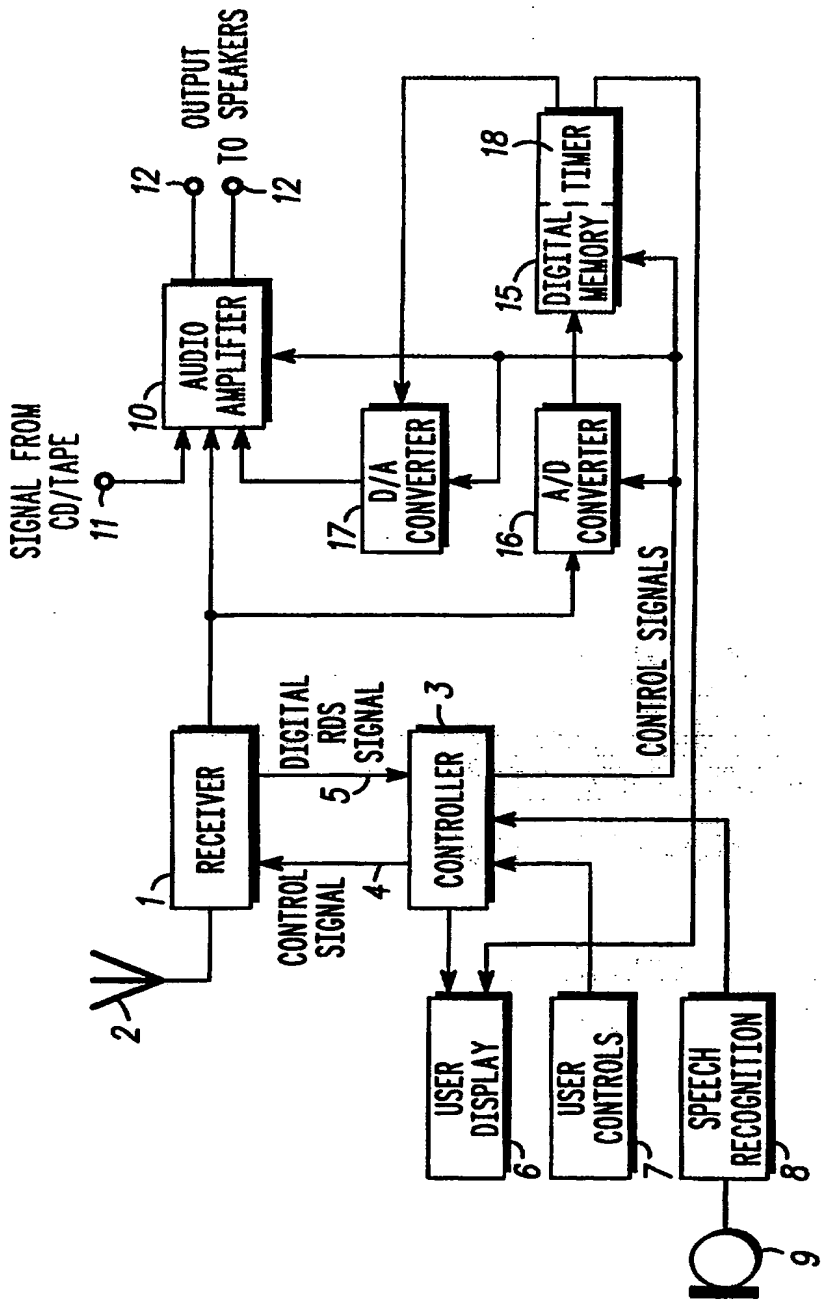


FIG. 1

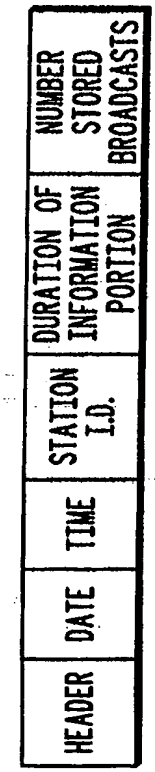


FIG. 3

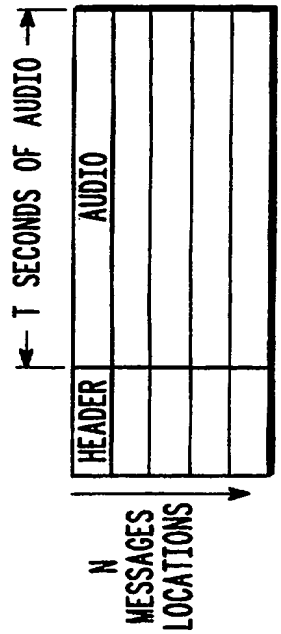


FIG. 2

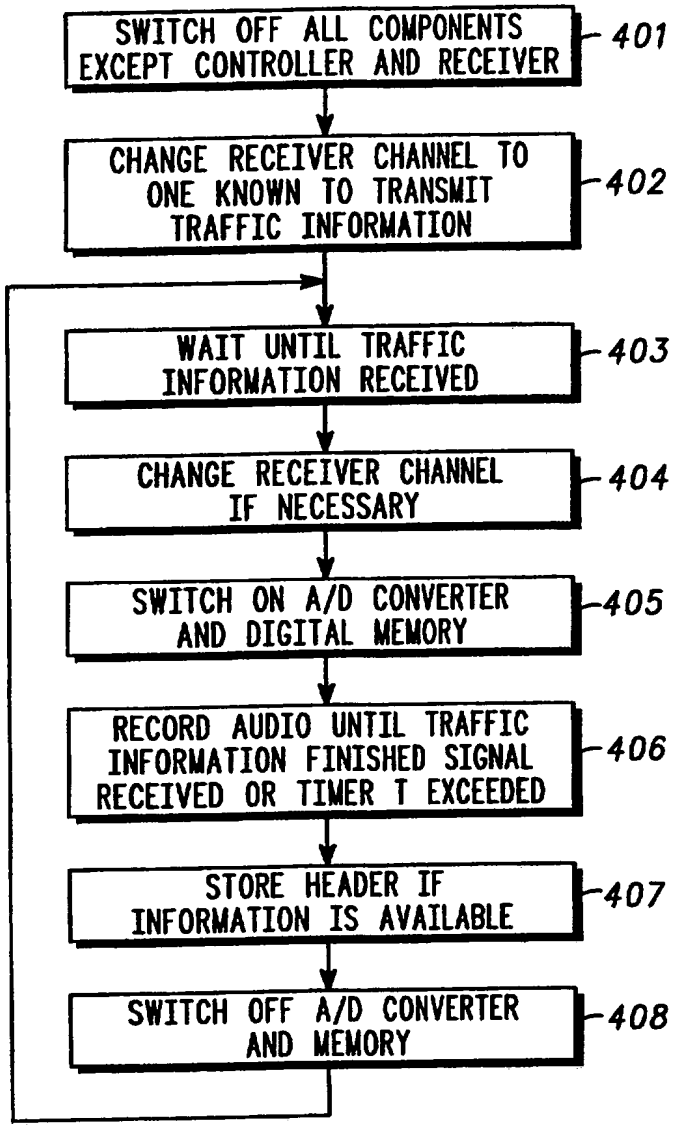


FIG. 4

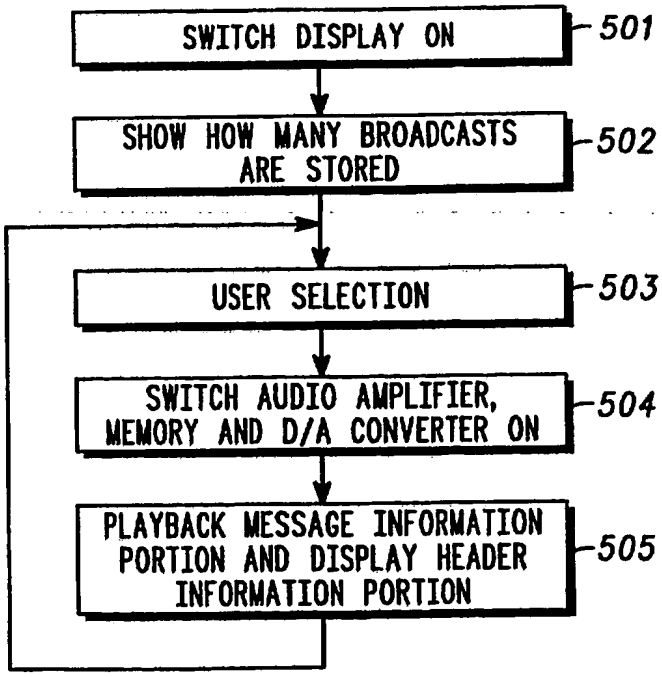


FIG. 5

# MOBILE COMMUNICATIONS DEVICE

## Background of the Invention

This invention relates to a mobile communications device and particularly to a device for using a Radio Data System (RDS) broadcast signal.

The RDS system has been widely adopted and is a standard feature in many In-Car Entertainment (ICE) systems. One of the features of the system is to temporarily re-tune a radio channel that is being listened to, or to pause a tape or compact disc playback, for the duration of transmitted travel information.

The travel information usually serves to inform a car driver of the location of traffic congestion and the cause of such congestion, thereby enabling the driver to avoid the location where congestion is being experienced.

Thus, it is known to provide traffic information services through the RDS in which a message signal is broadcast advising receiving radios, usually mobile radios mounted on a vehicle, when traffic reports are about to be transmitted by nearby radio stations. A vehicle radio, when switched to an RDS receiving mode, will then re-tune the radio, if necessary, from a radio channel being received to a radio channel broadcasting the traffic report, i.e. conveying the traffic information (TI) broadcast signal. At the end of the broadcast, another message signal is transmitted by the RDS transmitting station to signal the end of the traffic information. For each station transmitting an RDS broadcast signal the period between traffic announcements is usually between 15 - 20 minutes.

Because of this time period between traffic announcements, it is rare for the start of a user's journey to coincide with a travel information announcement. However, because of the period between traffic announcements it is often the situation that a driver has made a decision to travel a certain route without knowledge of the prevailing traffic conditions, and the driver may invariably have decided to adopt a different route if the driver had been made aware of the location of congestion. As a consequence, the usefulness of traffic announcements on the RDS is limited.

The present invention seeks to avoid the foregoing difficulty so as to enhance the usefulness of TI using RDS.

## Summary of the Invention

According to a broadest aspect of this invention there is provided a mobile communication device including means for continuously monitoring and receiving a Radio Data System (RDS) broadcast signal, and means for storing a transmitted traffic announcement associated with the received RDS broadcast signal for subsequent use.

According to one aspect of this invention there is provided a mobile communications device including receiver means arranged to receive a Radio Data System (RDS) broadcast signal, store means coupled to said receiver means for storing a broadcast traffic announcement with said RDS broadcast signal, and means for retrieving said traffic announcement from said store means for utilisation.

In a preferred embodiment, said broadcast traffic announcement is an audio signal and said receiver means

includes means for extracting said audio signal, whereby said audio signal is stored, in use, by said store means.

Conveniently, said traffic announcement is an analogue signal and said extracting means is a demodulator.

Advantageously, said store means is a digital memory.

Where said traffic announcement is an analogue signal and said store means is a digital memory, preferably an analogue/digital converter is interposed between said receiver means and said digital memory.

Advantageously, an output of said retrieving means is applied to at least one of display means and aural means, such as an audio amplifier driving at least one loud speaker.

Conveniently, said digital memory is arranged to store plural messages, each representative of a respective traffic announcement.

Advantageously, each said plural message comprises a header portion and an information portion comprising said audio signal indicative of road traffic conditions.

Conveniently, said header portion includes at least one of date, time, broadcasting station, identifier, number of stored broadcasts, duration of the information portion of each stored broadcast, and whether the user has accessed the said message of said stored broadcast.

Advantageously, said store means include timer means for limiting the time duration of a stored traffic announcement broadcast signal. Normally said time duration exceeds an expected duration of said broadcast traffic announcement and is utilised in, for example, conditions of poor reception where a termination signal

of the traffic announcement by the RDS broadcast signal is not detected by said receiver means.

Preferably, said store means includes a speech compression algorithm known per se for maximising the required storage space required for said stored traffic announcement broadcast signal.

Advantageously, disable means are provided for disabling elements of said device in a stand-by mode except for an RDS broadcast signal detector of said receiver means and controller means for enabling said store means to store said received broadcast traffic announcement.

Conveniently, means are provided for a user to specify time periods for monitoring and recording said RDS broadcast signal and, advantageously, means are provided for reducing the rate at which said RDS broadcast signal is monitored and/or said traffic announcement recorded.

Advantageously, means are provided for monitoring a signal strength of a transmitter from which said traffic announcement is transmitted prior to and during receipt of said traffic announcement and for disabling said store means if said signal strength falls below a predetermined level.

In a further aspect of this invention there is provided a method of operating a mobile communications device including the steps of providing receiver means tuning said receiver means to receive a Radio Data System (RDS) broadcast signal, storing a broadcast traffic announcement associated with said received RDS broadcast signal in store means, and retrieving said broadcast traffic announcement from said store means for utilisation.

Preferably, said broadcast traffic announcement is an audio signal and the receiver means detects said audio signal and applies said audio signal to said store means.

Conveniently, the traffic announcement is an analogue signal and the step of detecting is performed by a demodulator.

Advantageously, the store means is a digital memory and where said traffic announcement is an analogue signal and said store means is a digital memory, an analogue/digital conversion is performed between said receiver means and said digital memory.

Advantageously, following the step of retrieving, an output of said store means is applied to at least one of display means and aural means, such as an audio amplifier driving at least one loud speaker.

Conveniently, the step of storing includes storing plural messages, wherein each message is representative of a respective traffic announcement.

Advantageously, each plural message comprises a header portion and an information portion comprising said audio signal indicative of road traffic conditions.

Conveniently, said header portion includes at least one of date, time, broadcasting station identification, number of stored broadcasts, duration of the information portion of each stored broadcast signal, and whether a user has accessed the message of said stored broadcast.

Advantageously, the time duration of a stored broadcast traffic announcement is limited and normally the time duration exceeds an expected duration of the broadcast traffic announcement.

Preferably, the broadcast traffic announcement that is applied to the store means is subject to speech compression by an algorithm known per se.

Advantageously, elements of the device are disabled in a stand-by mode except for an RDS broadcast signal detector in the receiver means and a controller means for enabling the store means to store said received broadcast traffic announcement.

Conveniently, a user is able to specify time periods for monitoring and recording said RDS broadcast signal. Advantageously, the rate at which said RDS broadcast signal is monitored and/or said traffic announcement recorded may be adjusted by a user.

Advantageously, a signal strength of a transmitter from which said broadcast traffic announcement is transmitted is monitored prior to, and during, receipt of said broadcast traffic announcement, and said store means is disabled if said signal strength falls below a predetermined level.

Although the present invention is principally directed toward an in-car entertainment system or a simple radio, both of which are capable of using RDS, the invention is to be understood as not being limited thereto, and the invention may be used, for example, in a Terrestrial Trunked Radio (TETRA), or in a mobile telephone system, such as a Global System for a Mobile (GSM) telephone, or a Universal Mobile Telephone System (UMTS) operable unit.

## Brief Description of the Drawings

The invention will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 shows a block schematic diagram of an embodiment of a mobile communications device in

accordance with this invention where the invention is used in an In-Car Entertainment (ICE) system,

Figure 2 shows in schematic form a digital memory configuration,

Figure 3 shows in schematic form information data that may be held in a header portion of a stored message,

Figure 4 shows a flow diagram of the device shown in Figure 1 operating from a stand-by mode, and

Figure 5 shows a play-back mode of the device shown in Figure 1.

In the Figures like reference numerals denote like parts.

## Detailed Description of the Drawings

The ICE system incorporating this invention shown in Figure 1 has a receiver 1 capable of receiving (normally digital) RDS broadcast signals via an antenna 2. The receiver 1 is in two-way communication with a controller 3 such that control signals from the controller are transmitted over path 4 and the digital RDS signal is transmitted over path 5 from the receiver to the controller. The controller is connected to a user display 6 for displaying, for example, a frequency to which the receiver is tuned, a station identification or details of a track being played on a tape or CD. The controller 3 is connected to receive input instructions from user controls 7 such as ON/OFF, channel selection, volume, tone and switching RDS reception ON/OFF, for example. The controller may also receive input instructions from a speech recognition circuit 8 connected to a microphone input 9 so that a user may use voice controls for operating the controller.

The receiver receives a broadcast audio and provides an analogue audio signal to an audio amplifier 10, although it is to be understood that if the receiver were a digital receiver then a digital signal would be transmitted to the audio amplifier. In an ICE system, the audio amplifier 10 may also receive an input from a CD device or tape device input terminal 11. Output from the audio amplifier is applied to one or more pairs of loud speaker terminals 12.

As thus far described, the mobile communication device is conventional. The present invention additionally provides a digital storage memory 15 which stores a traffic announcement indicative of TI associated with the RDS broadcast signal after it is analogue-to-digital (A/D) converted in an A/D converter 16. The memory 15 has an output to a digital-to-analogue (D/A) converter 17 which is then applied as an input to the audio amplifier 10 for aural use. The memory 15 may also provide a visual identifier of a stored broadcast station to the display 6.

The display 6 may also be used to display satellite navigation information from, for example, a Global Positioning Satellite (GPS) system, or a roadside beacon system providing traffic information such as operated by TRAFFICMASTER™. Thus, the information from the stored broadcast traffic announcement, i.e. aural signal, may be used in conjunction with the visual display to provide user information for navigating around a particular location where congestion occurs.

In use, the present invention enables the receiver to continuously monitor RDS broadcast signals even when elements of the communications device are otherwise switched OFF, i.e. no power is supplied. In this

respect, the device has a stand-by mode in which power is supplied to the receiver 1 and the controller 3 only. When an RDS signal is received the controller powers the memory 15 ON so that the traffic announcements associated with respective RDS signals are stored by the memory 15.

In normal use, with the device shown in Figure 1 activated, if the receiver 1 is switched to receive an RDS signal, then if the receiver is tuned to a channel other than a channel over which an incoming RDS broadcast signal is to be received, the receiver is notified by an RDS broadcasting station that an RDS broadcast signal is about to be transmitted and the receiver re-tunes, if necessary, to the RDS transmitter broadcasting the traffic announcement. Receipt of the broadcast signal containing audio information representative of road traffic information causes the controller 3 to apply a control signal to the memory 15 and the A/D converter 16,and to, preferably, display the RDS station identifier on the display 6. The received traffic announcement audio information signal is applied from the receiver 1 via the A/D converter 16 to be stored in the memory 15.

It will now be understood that TI associated with RDS broadcasts may be stored by the memory 15 prior to full activation of the communication device by a user. Upon switching ON the device, the user is able to re-play the latest road traffic reports indicated by the information stored in the memory 15 so that the user is pre-warned of traffic congestion before starting a journey. Preferably, when in stand-by mode, each subsequent recording of RDS broadcasts overwrites the immediately preceding broadcast.

Thus, the memory is able to store the most recently received broadcasts for access by the user prior to commencing a journey.

An example of the configuration of the digital memory 15 is shown in Figure 2. The memory is configured to, preferably, have N locations each having, as well as audio information, some header information which is shown in Figure 3 as including whether the user has re-played the information, the date and time of the received broadcast, the station identifier of the station making the broadcast, the duration of the (usually audio) information portion of the received TI, and the number of stored broadcasts in the memory. The audio information storage portion is limited in time T by a timer 18 where T is a time amount in excess of the longest expected duration of a RDS broadcast traffic announcement so as to turn the memory OFF in the event of conditions of poor reception so that the memory is not erroneously left in a record mode, i.e. where the RDS broadcast termination signal is not detected by the receiver 1.

The memory 15 may include a speech compression algorithm known per se, such as that used in the European Terrestrial Trunked Radio (TETRA) standard, i.e. an algorithm known as Algebraic Code Excited Linear Prediction (ACELP).

Because of the use of a stand-by mode there is some increase in power consumption of the communication device. This increase in power consumption may be minimised to avoid depletion of a mobile power source, e.g. a battery when the device is not used for relatively long periods of time, e.g. not used daily. The power consumption is limited in the stand-by mode by the

aforementioned step of powering only the receiver and controller, and memory when required.

Another manner of conserving power that may be used instead of the forementioned stand-by mode, or as well as the forementioned stand-by mode, is for a user to specify time periods over which it is desired to monitor and record RDS broadcasts. For example, a driver of a vehicle in which the device is mounted may only be interested in RDS travel bulletins between 7 - 9a.m. and between 3 - 6p.m. Accordingly, the user may input such time constraints via the user controls 7.

An alternative or additional manner of reducing the rate at which the RDS broadcast signals are monitored is for the controller to determine if the memory has not been accessed for a long period of time, for example after two days, whereupon the receiver may be switched to store received broadcast traffic announcements only every two hours or so.

The receiver advantageously monitors the strength of the received broadcast traffic announcement both prior to and during receipt of the announcement. If the signal strength drops below a predetermined value, or drops below a predetermined value for a predetermined length of time, the memory 15 may be disabled so that the received broadcast is either not stored at all or recording in the memory is aborted. Such a manner of operation ensures that the information stored by the memory 15 is maintained at an acceptable quality level.

Operation of the device shown in Figure 1 from a stand-by mode will now be described with reference to Figure 4, in which all components except the controller and receiver are switched OFF at step 401. At step 402, the receiver channel is changed to a channel known to

transmit traffic information via RDS and the receiver waits until a signal is received indicative of commencement of a broadcast traffic announcement (step 403). If the receiver is tuned to a channel other than the channel that is about to transmit the traffic information, so the receiver re-tunes to the channel about to broadcast the TI at step 404. The controller 3 powers the memory 15 and the A/D converter 16 ON (step 405) and the memory 15 records the received audio traffic information until the RDS broadcast station transmits an end of transmission signal or the timer in the store means indicates that a predetermined time duration has been exceeded at step 406.

The memory is arranged to store a new traffic announcement in the next storage location, or if all N message locations (shown in Figure 2) are occupied, then the new message overwrites the oldest stored message. If header information is available, such as that shown in Figure 3, then, at step 407, the header information is stored concurrently with the audio information. Upon receipt of the RDS broadcast signal indicating the end of the TI, or a time-out signal being generated by the timer 18, so the device is switched back to a stand-by mode at step 408 by switching OFF the A/D converter 16 and the memory 15, and the device recycles to step 403.

In the playback mode shown by the flow diagram of Figure 5, the user switches ON the display 6 (step 501) to show the number of broadcasts that are recorded (step 502). The display, at step 502, may also show the broadcast station that transmitted the recorded information and a user may select that particular station at step 503 or the user may select the last one or two (or more) messages that have been stored. The user

selection at step 503 may be accomplished by user controls 7 or by using speech recognition 8 via a microphone (not shown) connected to input 9. Upon making the selection, the audio amplifier 10 and D/A converter are switched ON (step 504) and the selected stored information is played back via audio amplifier 10 to provide aural signals via output speakers (not shown) connected at terminals 12 and the header information may be displayed on display 6 (step 505). From step 505 the programme recycles to step 503.

Although a digital stored memory is preferred, it is to be understood that an analogue memory may, alternatively, be used, in which event the A/D converter 16 and the D/A converter 17 would not be required.

**CLAIMS:**

1. A mobile communication device including means (1, 2) for continuously monitoring and receiving a Radio Data System (RDS) broadcast signal, and means (3, 15, 16) for storing a transmitted traffic announcement associated with the received RDS broadcast signal for subsequent use.

2. A mobile communications device including receiver means (1, 2) arranged to receive a Radio Data System (RDS) broadcast signal, store means (15) coupled to said receiver means for storing a broadcast traffic announcement associated with said RDS broadcast signal, and means (3, 10, 12, 17) for retrieving said traffic announcement from said store means for utilisation.

3. A device as claimed in claim 2, wherein said broadcast traffic announcement is an audio signal and said receiver means (1, 2) includes means for extracting said audio signal, whereby said audio signal is stored, in use, by said store means (15).

4. A device as claimed in claim 2 or 3, wherein said traffic announcement is an analogue signal and said extracting means is a demodulator.

5. A device as claimed in claim 2 or 3, wherein said store means (15) is a digital memory.

6. A device as claimed in claim 3, wherein where said traffic announcement is an analogue signal and said store means (15) is a digital memory, an analogue/digital converter (16) is interposed between said receiver means and said digital memory.

7. A device as claimed in claims 2 to 5, wherein an output of said retrieving means is applied to at least one of display means (6) and aural means (10, 12).

8. A device as claimed in claim 6, wherein said digital memory (15) is arranged to store plural messages, each representative of a respective traffic announcement.

9. A device as claimed in claim 8, wherein each said plural message comprises a header portion and an information portion comprising said audio signal indicative of road traffic conditions.

10. A device as claimed in claim 9, wherein said header portion includes at least one of date, time, broadcasting station, identifier, number of stored broadcasts, duration of the information portion of each stored broadcast, and whether the user has accessed the said message of said stored broadcast.

11. A device as claimed in claims 2 to 10, wherein said store means include timer means (18) for limiting the time duration of a stored traffic announcement broadcast signal.

12. A device as claimed in claims 2 to 11, wherein said store means (15) includes a speech compression algorithm

known per se for maximising the required storage space required for said stored traffic announcement broadcast signal.

13. A device as claimed in claim 2 or 3, wherein disable means (408) are provided for disabling elements of said device in a stand-by mode except for an RDS broadcast signal detector of said receiver means (1, 2) and controller means (3) for enabling said store means to store said received broadcast traffic announcement.

14. A device as claimed in claims 2 to 13, wherein means (503) are provided for a user to specify time periods for monitoring and recording said RDS broadcast signal

15. A device as claimed in claims 2 to 14, wherein means are provided for reducing the rate at which said RDS broadcast signal is monitored and/or said traffic announcement recorded.

16. A device as claimed in claims 2 to 15, wherein means are provided for monitoring a signal strength of a transmitter from which said traffic announcement is transmitted prior to and during receipt of said traffic announcement and for disabling said store means if said signal strength falls below a predetermined level.

17. A method of operating a mobile communications device including the steps of providing receiver means (1, 2) tuning said receiver means to receive a Radio Data System (RDS) broadcast signal, storing a broadcast traffic announcement associated with said received RDS broadcast signal in store means (15), and retrieving (3, 10, 12,

17) said broadcast traffic announcement from said store means for utilisation.

18. A method as claimed in claim 17, wherein said broadcast traffic announcement is an audio signal and the receiver means (1) detects said audio signal and applies said audio signal to said store means (15).

19. A method as claimed in claim 17 or 18, wherein the traffic announcement is an analogue signal and the step of detecting is performed by a demodulator.

20. A method as claimed in claims 17 to 19, wherein the store means is a digital memory.

21. A method as claimed in claims 17 to 19, wherein where said traffic announcement is an analogue signal and said store means is a digital memory, an analogue/digital conversion (16) is performed between said receiver means (1, 2) and said digital memory (15).

22. A method as claimed in claims 17 to 21, wherein following the step of retrieving, an output of said store means (15) is applied to at least one of display means (6) and aural means (10, 12).

23. A method as claimed in claims 17 to 22, wherein the step of storing includes storing plural messages, wherein each message is representative of a respective traffic announcement.

24. A method as claimed in claim 23, wherein each plural message comprises a header portion and an information

portion comprising said audio signal indicative of road traffic conditions.

25. A method as claimed in claim 24, wherein said header portion includes at least one of date, time, broadcasting station identification, number of stored broadcasts, duration of the information portion of each stored broadcast signal, and whether a user has accessed the message of said stored broadcast.

26. A method as claimed in claims 17 to 25, wherein the time duration of a stored broadcast traffic announcement is limited and normally the time duration exceeds an expected duration of the broadcast traffic announcement.

27. A method as claimed in claims 17 to 26, wherein the broadcast announcement that is applied to the store means is subject to speech compression by an algorithm known per se.

28. A method as claimed in claims 17 to 27, wherein elements of the device are disabled in a stand-by mode except for an RDS broadcast signal detector in the receiver means (1, 2) and a controller means (3) for enabling the store means to store said received broadcast traffic announcement.

29. A method as claimed in claims 17 to 28, wherein a user is able to specify time periods for monitoring and recording said RDS broadcast signal.

30. A method as claimed in claims 17 to 29, wherein the rate at which said RDS broadcast signal is monitored

and/or said traffic announcement recorded may be adjusted by a user.

31. A method as claimed in claims 17 to 30, wherein a signal strength of a transmitter from which said broadcast traffic announcement is transmitted is monitored prior to, and during, receipt of said broadcast traffic announcement, and said store means is disabled if said signal strength falls below a predetermined level.

The Patent Office

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**Application No:** GB 9930579.9
**Claims searched:** 1 to 31

**Examiner:** Glyn Hughes
**Date of search:** 27 June 2000

# Patents Act 1977
# Search Report under Section 17

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): H4L (LECTP, LERM), H3Q (QRDS)

Int Cl (Ed.7):

Other: Online: WPI, JAPIO, EPODOC

**Documents considered to be relevant:**

| Category | Identity of document and relevant passage | | Relevant to claims |
|---|---|---|---|
| X | GB 2275849 A | (BLAUPUNKT) see page 1 | 1-8, 13, 15, 17-23, 28 |
| X | EP 0623896 A2 | (BOSCH) see WPI abstract | 1, 2, 12, 17, 27 |
| X | US 6038434 | (MIYAKE) column 5 line 43 to column 9 line 55 | 1, 2, 5, 7, 8, 9, 17, 20, 22, 23, 24 |
| X | US 5394562 | (SPELTER ET AL) see whole document | 1, 2, 13, 17, 28 |

| | | | |
|---|---|---|---|
| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. | P | Document published on or after the declared priority date but before the filing date of this invention. |
| & | Member of the same patent family | E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |



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